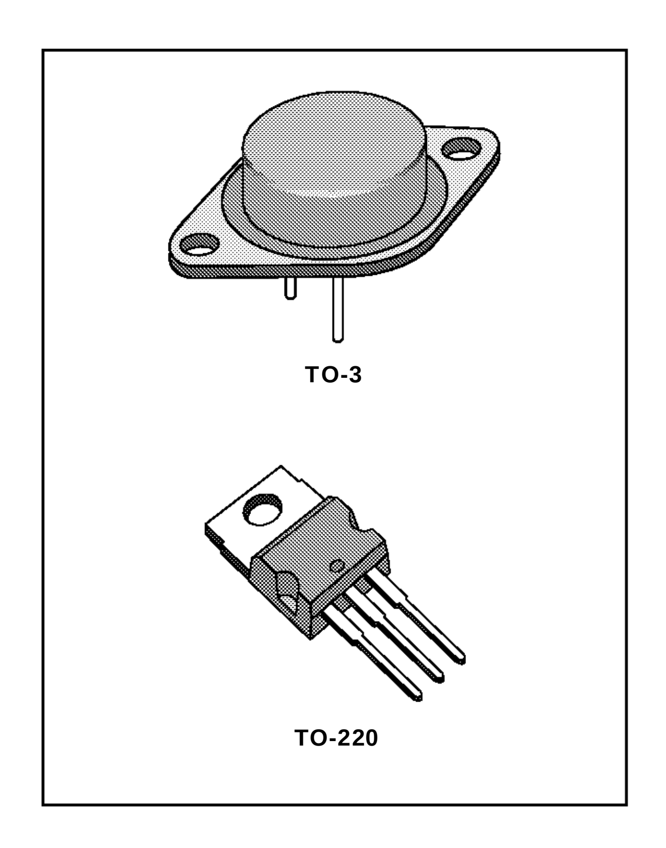
SGS-THOMSON MICROELECTRONICS

L78S00 SERIES

2A POSITIVE VOLTAGE REGULATORS

- OUTPUT CURRENT TO 2A
- OUTPUT VOLTAGES OF 5 ; 7.5 ; 9 ; 10 ; 12 ; 15 ; 18 ; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION

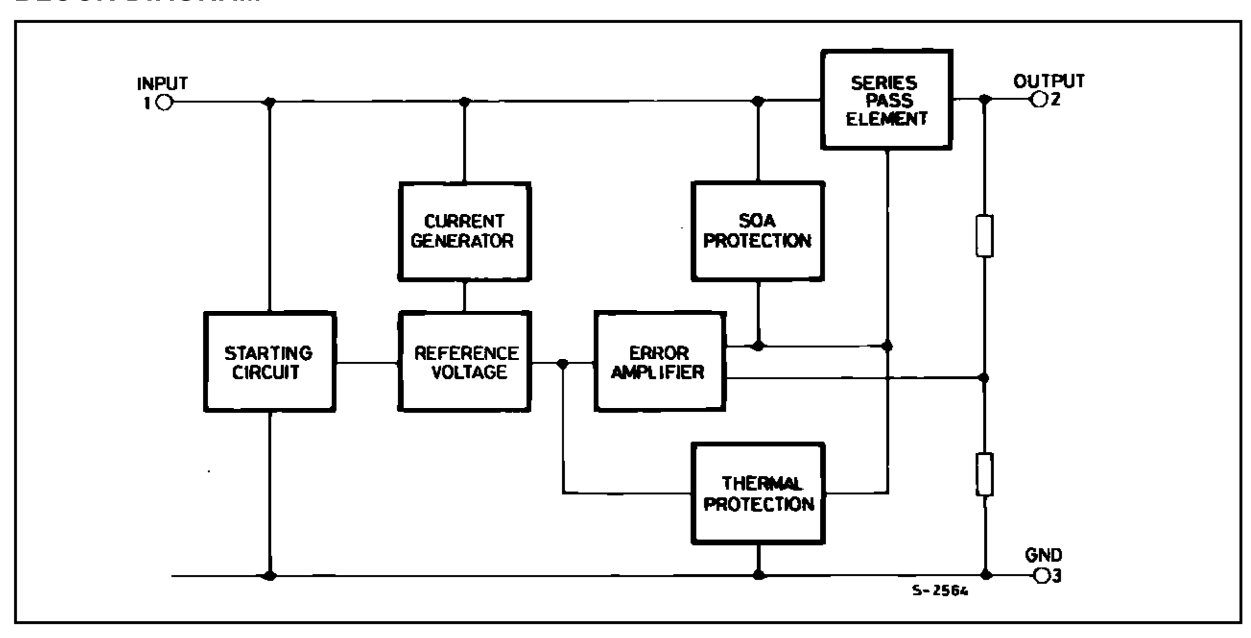




DESCRIPTION

The L78S00 series of three-terminal positive regulators is available in TO-220 and TO-3 packages and with several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 2A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

BLOCK DIAGRAM



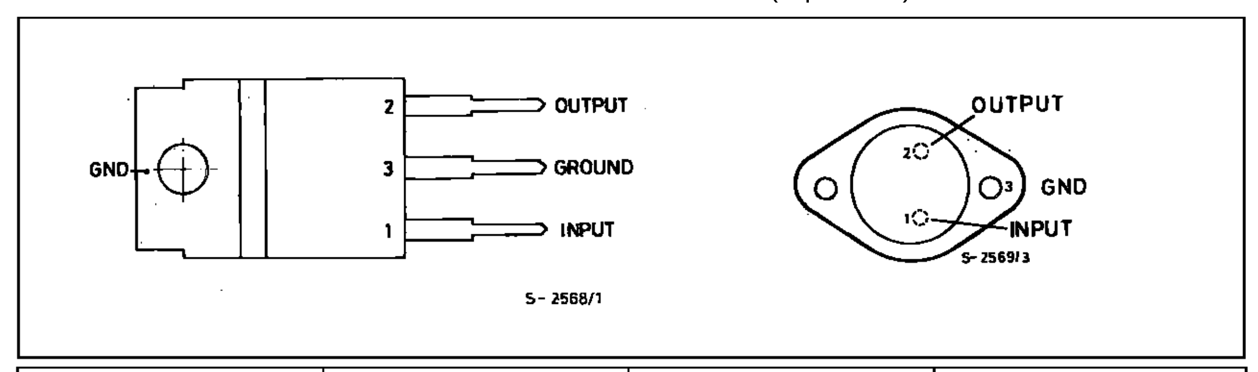
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_o = 5 to 18V) (for V_o = 24V)	35 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Power Dissipation	Internally limited	
T_{stg}	Storage Temperature	– 65 to + 150	°C
T_{op}	Operating Junction Temperature (for **L78S00**) (for **L78S00C**)	– 55 to + 150 0 to + 150	°C °C

THERMAL DATA

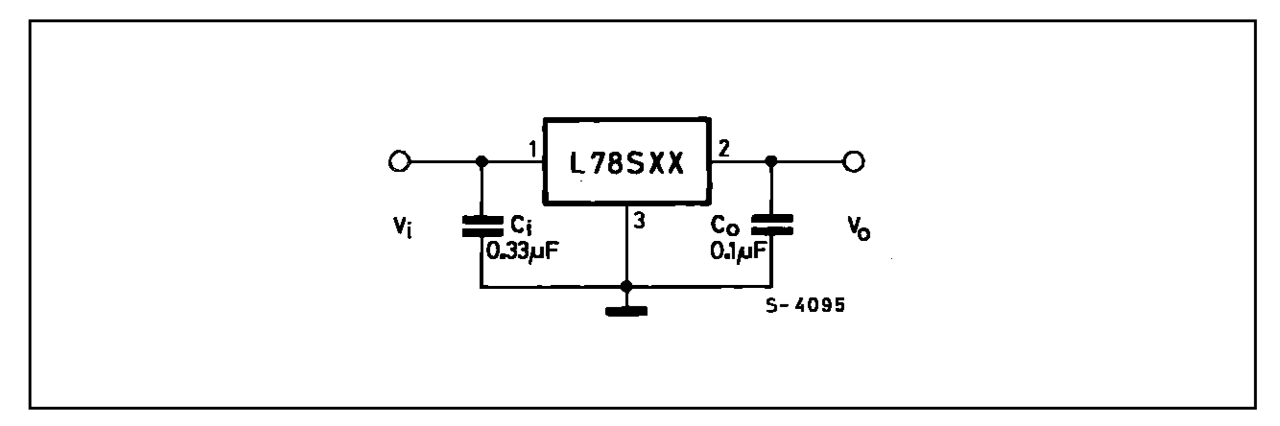
		TO-220	TO-3	
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case Max	3	4	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient Max	50	35	°C/W

CONNECTION DIAGRAMS AND ORDERING NUMBERS (top views)



Type	TO-220	TO-3	Output Voltage
L78S05		L78S05T	5 V
L78S05C	L78S05CV	L78S05CT	5 V
L78S75		L78S75T	7.5V
L78S75C	L78S75CV	L78S75CT	7.5V
L78S09		L78S09T	9 V
L78S09C	L78S09CV	L78S09CT	9 V
L78S10		L78S10T	10V
L78S10C	L78S10CV	L78S10CT	10V
L78S12		L78S12T	12V
L78S12C	L78S12CV	L78S12CT	12V
L78S15		L78S15T	15V
L78S15C	L78S15CV	L78S15CT	15V
L78S18		L78S18T	18V
L78S18C	L78S18CV	L78S18CT	18V
L78S24		L78S24T	24V
L78S24C	L78S24CV	L78S24CT	24V

APPLICATION CIRCUIT



SCHEMATIC DIAGRAM

TEST CIRCUITS

Figure 1 : DC Parameters.

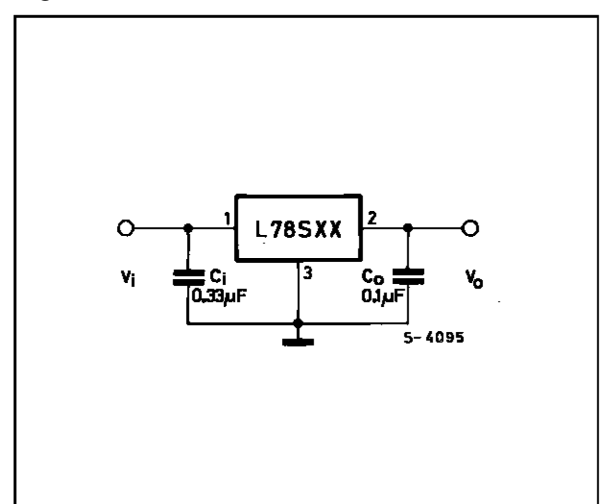


Figure 2 : Load Regulation.

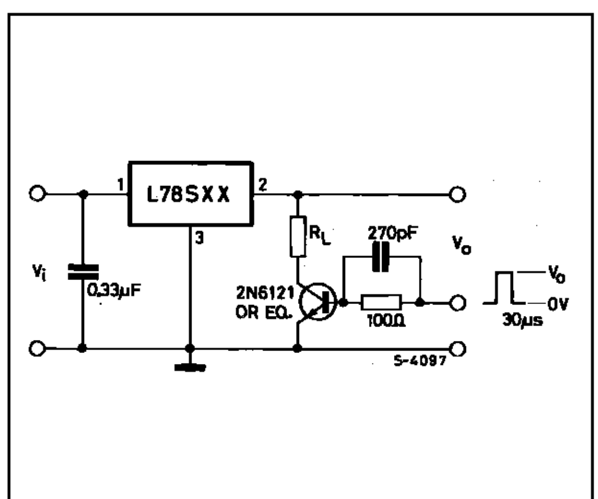
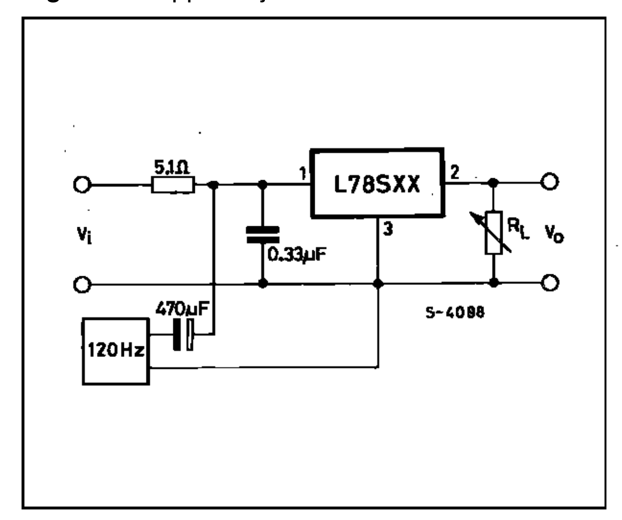


Figure 3 : Ripple Rejection.



ELECTRICAL CHARACTERISTICS FOR L78S05 (refer to the test circuits, T_j = 25 °C, V_i = 10V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		4.8	5	5.2	V
V_o	Output Voltage	I_o = 1 A V_i = 7 V	4.75	5	5.25	V
ΔV_o	Line Regulation	V_i = 7 to 25 V V_i = 8 to 25 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			100	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 7 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		40		μV
SVR	Supply Voltage Rejection	f = 120 Hz	60			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	8			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S75 (refer to the test circuits, T_j = 25 °C, V_i = 12.5V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		7.15	7.5	7.9	V
V_o	Output Voltage	I_o = 1 A V_i = 9.5 V	7.1	7.5	7.95	V
ΔV_o	Line Regulation	V_i = 9.5 to 25 V V_i = 10.5 to 20 V			120 60	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			120	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 9.5 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-0.8		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		52		μV
SVR	Supply Voltage Rejection	f = 120 Hz	54			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	10.5			V
R_o	Output Resistance	f = 1KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S09 (refer to the test circuits, T_j = 25 °C, V_i = 14V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		8.65	9	9.35	V
V_o	Output Voltage	I_o = 1 A V_i = 11 V	8.6	9	9.4	V
ΔV_o	Line Regulation	V_i = 11 to 25 V V_i = 11 to 20 V			130 65	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			130	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 11 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		60		μV
SVR	Supply Voltage Rejection	f = 120 Hz	53			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	12			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S10 (refer to the test circuits, T_j = 25 °C, V_i = 15V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		9.5	10	10.5	V
V_o	Output Voltage	I_o = 1 A V_i = 12.5 V	9.4	10	10.6	V
ΔV_o	Line Regulation	V_i = 12.5 to 30 V V_i = 14 to 22 V			200 100	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			150	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 12.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		65		μV
SVR	Supply Voltage Rejection	f = 120 Hz	53			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	13			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S12 (refer to the test circuits, T_j = 25 °C, V_i = 19V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		11.5	12	12.5	V
V_o	Output Voltage	I_o = 1 A V_i = 14.5 V	11.4	12	12.6	V
ΔV_o	Line Regulation	V_i = 14.5 to 30 V V_i = 16 to 22 V			240 120	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			160	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 14.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		75		μV
SVR	Supply Voltage Rejection	f = 120 Hz	53			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	15			V
R_o	Output Resistance	f = 1KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S15 (refer to the test circuits, T_j = 25 °C, V_i = 23V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		14.4	15	15.6	V
V_o	Output Voltage	I_o = 1 A V_i = 17.5 V	14.25	15	15.75	V
ΔV_o	Line Regulation	V_i = 17.5 to 30 V V_i = 20 to 26 V			300 150	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			180	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 17.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		90		μV
SVR	Supply Voltage Rejection	f = 120 Hz	52			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	18			V
R_o	Output Resistance	f = 1KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S18 (refer to the test circuits, T_j = 25 °C, V_i = 26V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		17.1	18	18.9	V
V_o	Output Voltage	I_o = 1 A V_i = 20.5 V	17	18	19	V
ΔV_o	Line Regulation	V_i = 20.5 to 30 V V_i = 22 to 28 V			360 180	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			200	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 22 to 33 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		110		μV
SVR	Supply Voltage Rejection	f = 120 Hz	49			dB
V_i	Operating Input Voltage	$I_o \leq 1.5$ A	21			V
R_o	Output Resistance	f = 1KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S24 (refer to the test circuits, T_j = 25 °C, V_i = 33V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		23	24	25	V
V_o	Output Voltage	I_o = 1 A V_i = 27 V	22.8	24	25.2	V
ΔV_o	Line Regulation	V_i = 27 to 38 V V_i = 30 to 36 V			480 240	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			250	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 8 to 25 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		170		μV
SVR	Supply Voltage Rejection	f = 120 Hz	48			dB
V_i	Operating Input Voltage	$I_o \leq 1.5$ A	27			V
R_o	Output Resistance	f = 1KHz		23		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S05C (refer to the test circuits, T_j = 25 ^oC, V_i = 10V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		4.8	5	5.2	V
V_o	Output Voltage	I_o = 1 A V_i = 7 V	4.75	5	5.25	V
ΔV_o	Line Regulation	V_i = 7 to 25 V V_i = 8 to 12 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 80	100	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 7 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 ^oC		-1.1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		40		μV
SVR	Supply Voltage Rejection	f = 120 Hz	54			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	8			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S75C (refer to the test circuits, T_j = 25 ^oC, V_i = 12.5V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		7.15	7.5	7.9	V
V_o	Output Voltage	I_o = 1 A V_i = 9.5 V	7.1	7.5	7.95	V
ΔV_o	Line Regulation	V_i = 9.5 to 25 V V_i = 10.5 to 20 V			120 60	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 100	140	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 9.5 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 ^oC		-0.8		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		52		μV
SVR	Supply Voltage Rejection	f = 120 Hz	48			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	10.5			V
R_o	Output Resistance	f = 1KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S09C (refer to the test circuits, T_j = 25 °C, V_i = 14V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		8.65	9	9.35	V
V_o	Output Voltage	I_o = 1 A V_i = 11 V	8.6	9	9.4	V
ΔV_o	Line Regulation	V_i = 11 to 25 V V_i = 11 to 20 V			130 65	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 100	170	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 11 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		60		μV
SVR	Supply Voltage Rejection	f = 120 Hz	47			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	12			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S10C (refer to the test circuits, T_j = 25 °C, V_i = 15V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		9.5	10	10.5	V
V_o	Output Voltage	I_o = 1 A V_i = 12.5 V	9.4	10	10.6	V
ΔV_o	Line Regulation	V_i = 12.5 to 30 V V_i = 14 to 22 V			200 100	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 150	240	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 12.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		65		μV
SVR	Supply Voltage Rejection	f = 120 Hz	47			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	13			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S12C (refer to the test circuits, T_j = 25 °C, V_i = 19V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		11.5	12	12.5	V
V_o	Output Voltage	I_o = 1 A V_i = 14.5 V	11.4	12	12.6	V
ΔV_o	Line Regulation	V_i = 14.5 to 30 V V_i = 16 to 22 V			240 120	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 150	240	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 14.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		75		µV
SVR	Supply Voltage Rejection	f = 120 Hz	47			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	15			V
R_o	Output Resistance	f = 1KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S15C (refer to the test circuits, T_j = 25 °C, V_i = 23V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		14.4	15	15.6	V
V_o	Output Voltage	I_o = 1 A V_i = 17.5 V	14.25	15	15.75	V
ΔV_o	Line Regulation	V_i = 17.5 to 30 V V_i = 20 to 26 V			300 150	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 150	300	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 17.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		90		µV
SVR	Supply Voltage Rejection	f = 120 Hz	46			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	18			V
R_o	Output Resistance	f = 1KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S18C (refer to the test circuits, T_j = 25 °C, V_i = 26V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		17.1	18	18.9	V
V_o	Output Voltage	I_o = 1 A V_i = 20.5 V	17	18	19	V
ΔV_o	Line Regulation	V_i = 20.5 to 30 V V_i = 22 to 28 V			360 180	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 200	360	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 20.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		110		μV
SVR	Supply Voltage Rejection	f = 120 Hz	43			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	21			V
R_o	Output Resistance	f = 1KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S24C (refer to the test circuits, T_j = 25 °C, V_i = 33V, I_o = 500 mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		23	24	25	V
V_o	Output Voltage	I_o = 1 A V_i = 27 V	22.8	24	25.2	V
ΔV_o	Line Regulation	V_i = 27 to 38 V V_i = 30 to 36 V			480 240	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 300	480	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 27 to 38 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		170		μV
SVR	Supply Voltage Rejection	f = 120 Hz	42			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	27			V
R_o	Output Resistance	f = 1KHz		28		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

Figure 4 : Dropout Voltage vs. Junction Temperature.

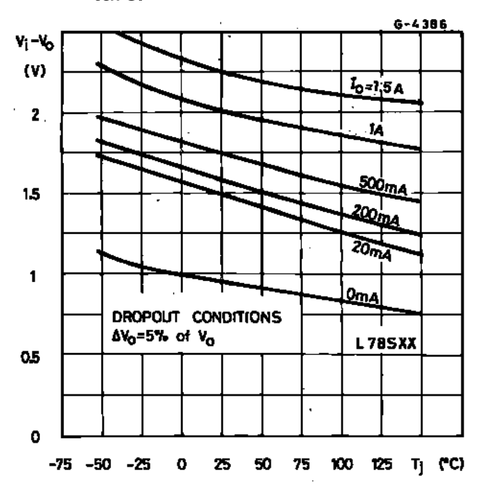


Figure 5 : Peak Output Current vs. Input/Output Differential Voltage.

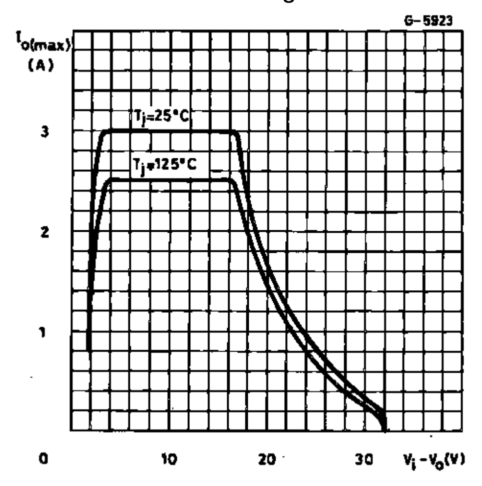


Figure 6 : Supply Voltage Rejection vs. Frequency.

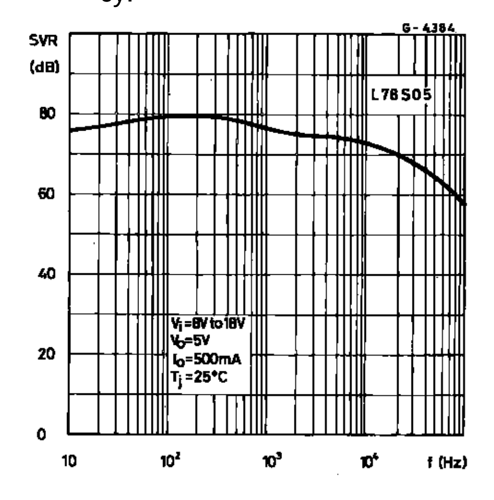


Figure 7 : Output Voltage vs. Junction Temperature.

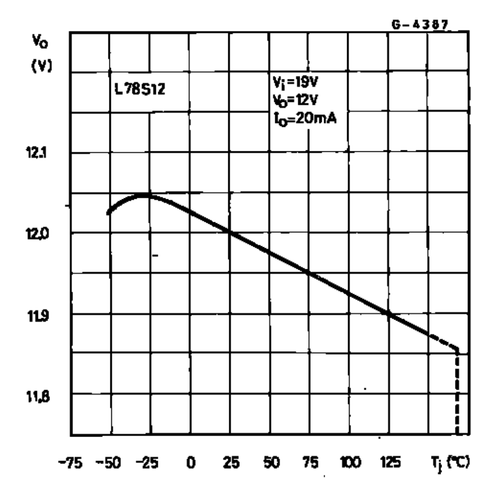


Figure 8 : Output Impedance vs. Frequency.

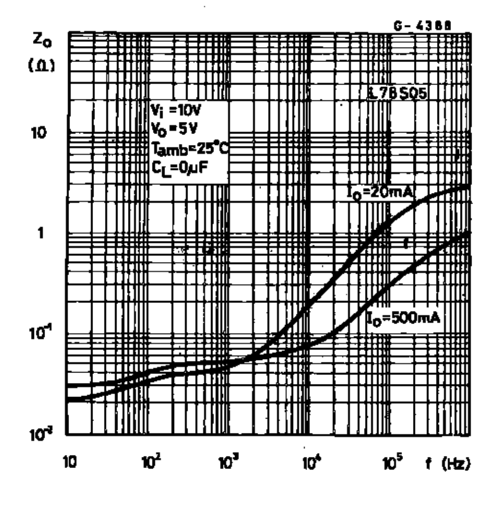


Figure 9 : Quiescent Current vs. Junction Temperature.

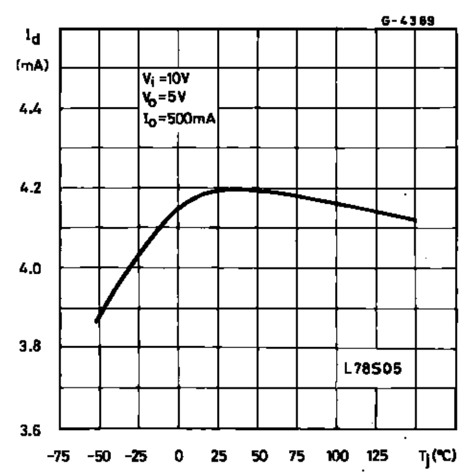


Figure 10 : Load Transient Response.

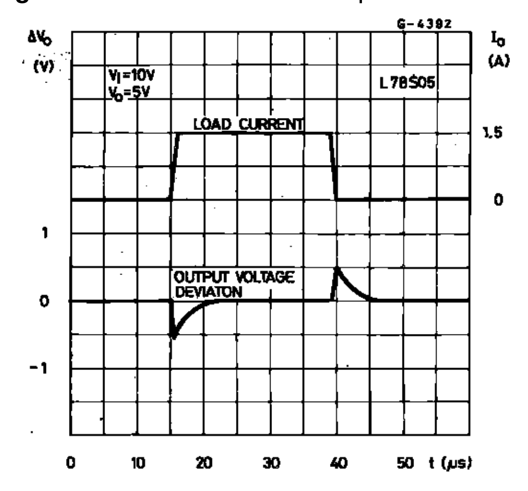


Figure 11 : Line Transient Response.

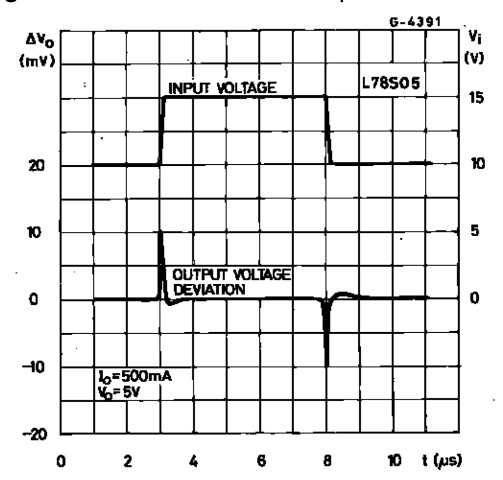


Figure 12 : Quiescent Current vs. Input Voltage.

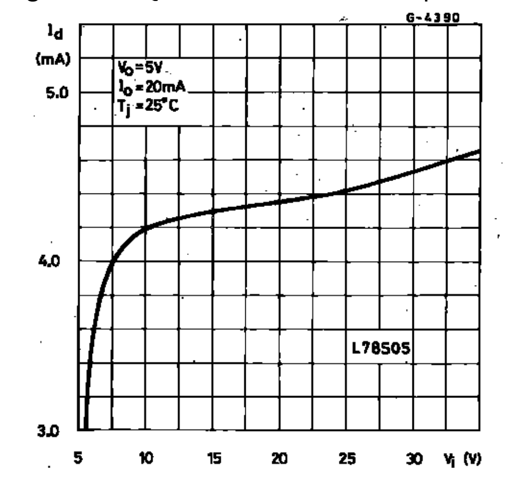
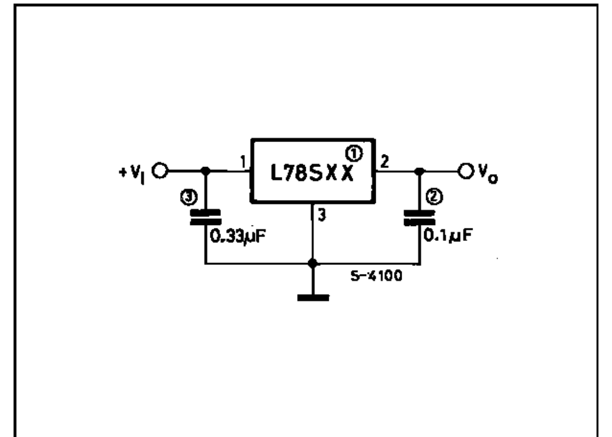
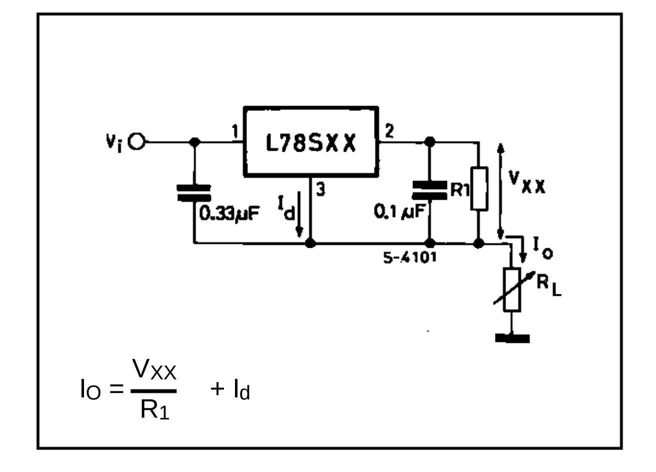


Figure 13 : Fixed Output Regulator.



Notes :
1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is needed for stability, it does improve transient response.
3. Required if regulator is located an appreciable dis-tance from power supply filter.

Figure 14 : Constant Current Regulator.



$$I_O = \frac{V_{XX}}{R_1} + I_d$$

Figure 15 : Circuit for Increasing Output Voltage.

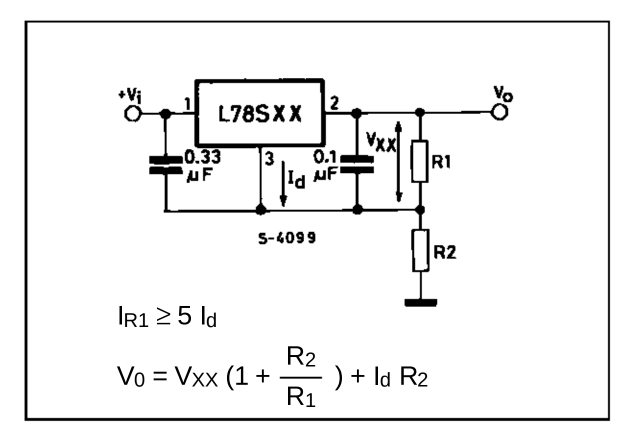


Figure 16 : Adjustable Output Regulator (7 to 30V).

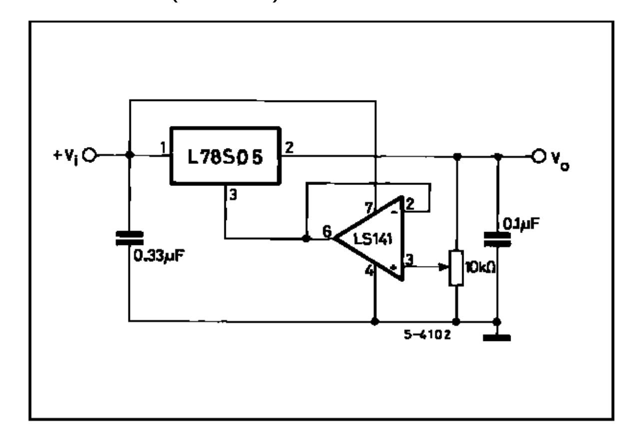


Figure 17 : 0.5 to 10V Regulator.

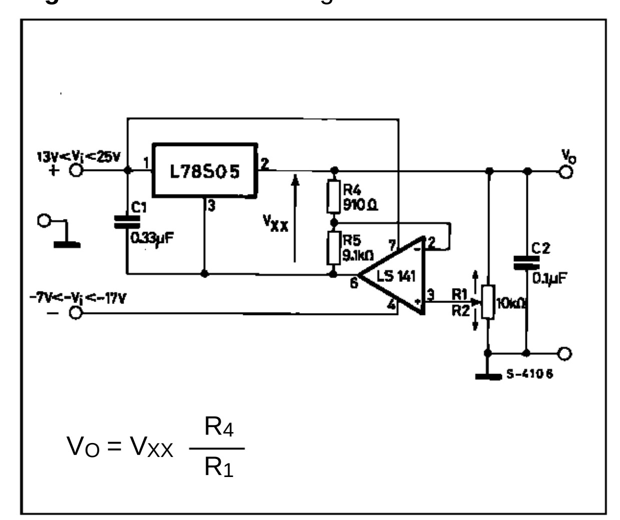


Figure 18 : High Current Voltage Regulator.

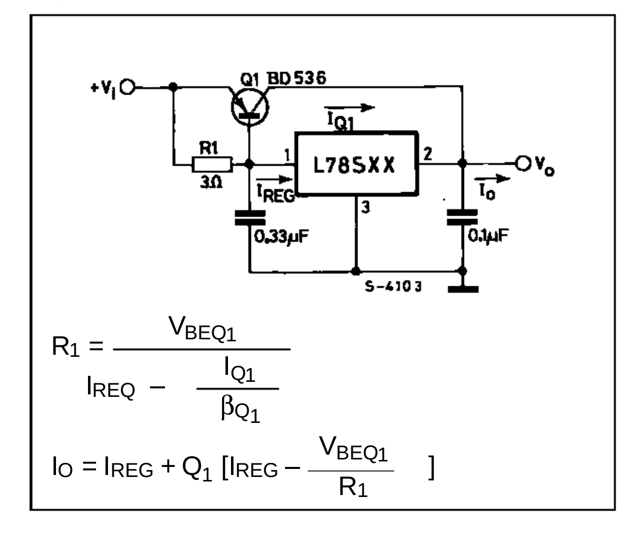


Figure 19 : High Output Current with Short Circuit Protection.

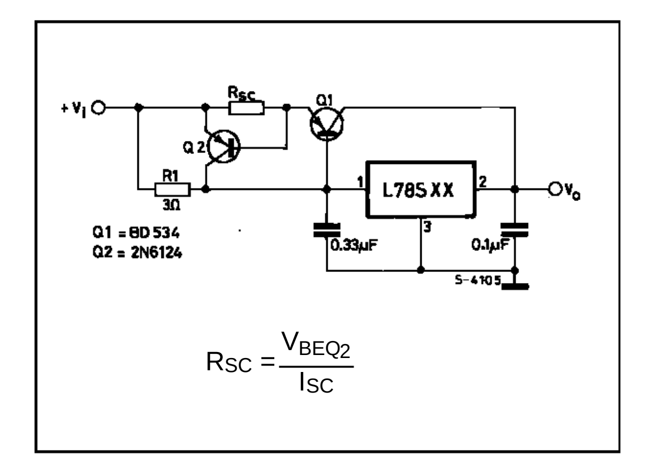


Figure 20 : Tracking Voltage Regulator.

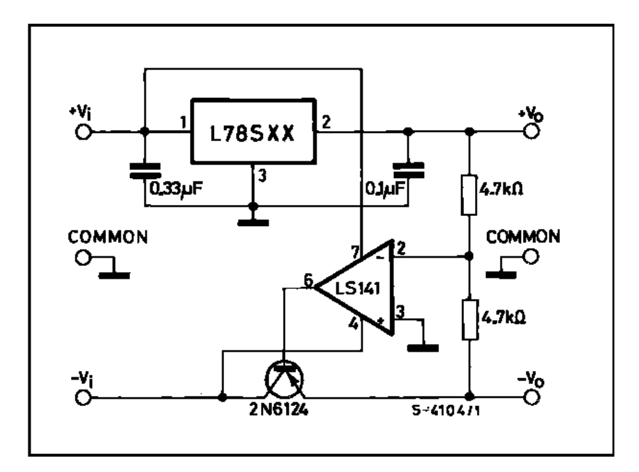
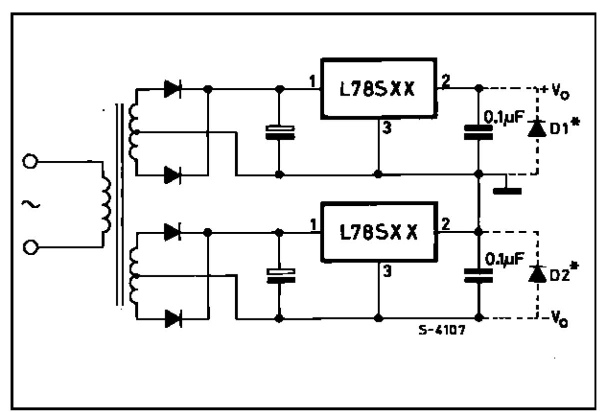


Figure 21 : Positive and Negative Regulator.



(*) D_1 and D_2 are necessary if the load is connected between + V_0 and – V_0.

Figure 22 : Negative Output Voltage Circuit.

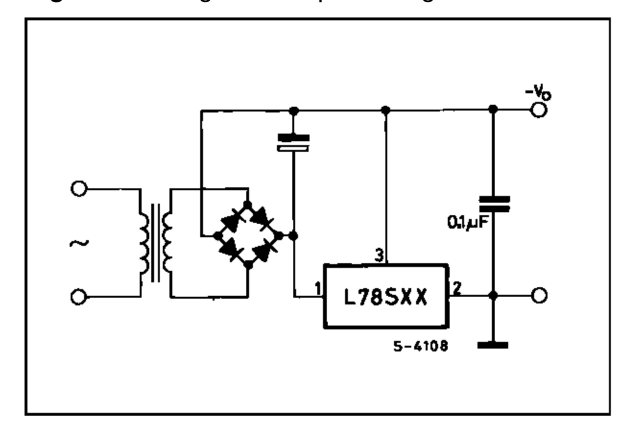


Figure 23 : Switching Regulator.

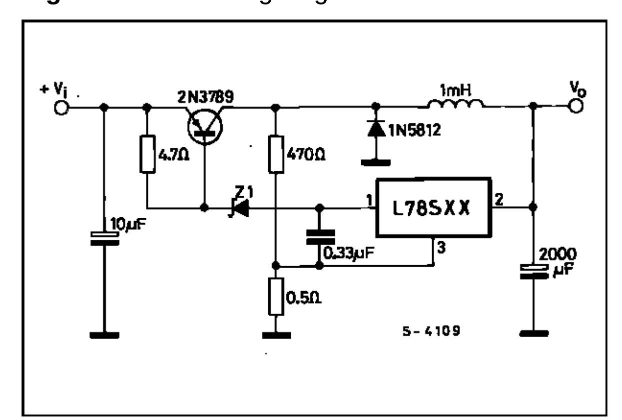
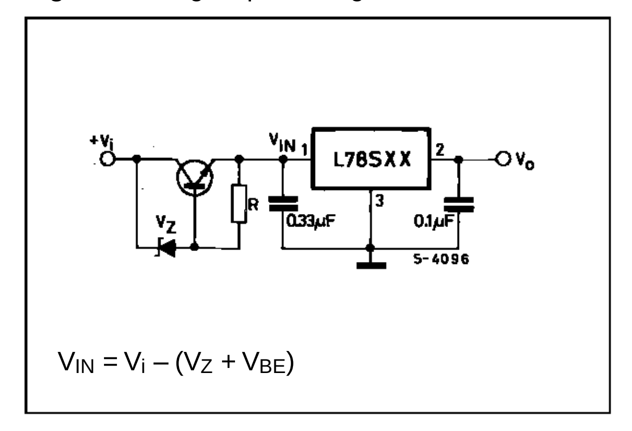
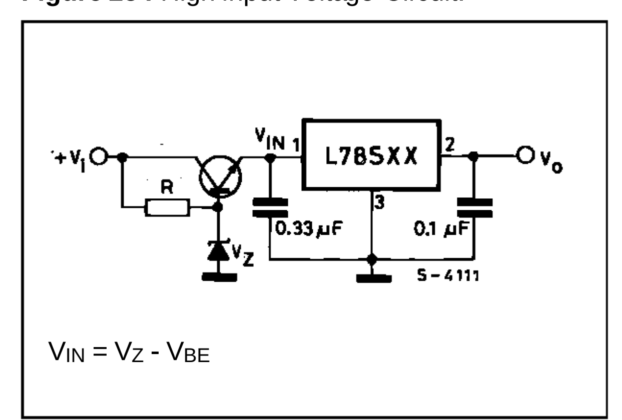


Figure 24 : High Input Voltage Circuit.



$V_{IN} = V_i – (V_Z + V_{BE})$

Figure 25 : High Input Voltage Circuit.



$V_{IN} = V_Z - V_{BE}$

Figure 26 : High Output VoltageRegulator.

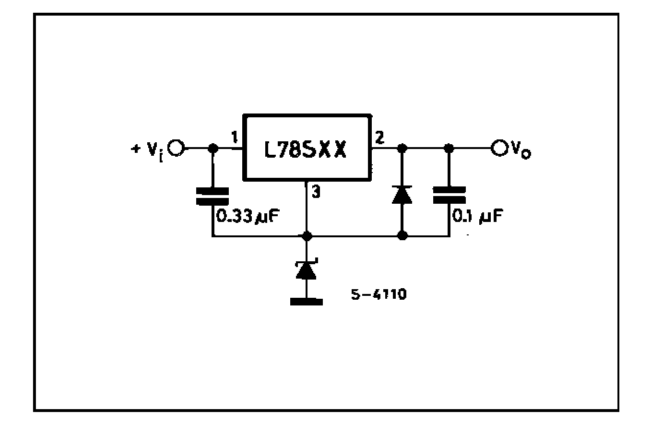
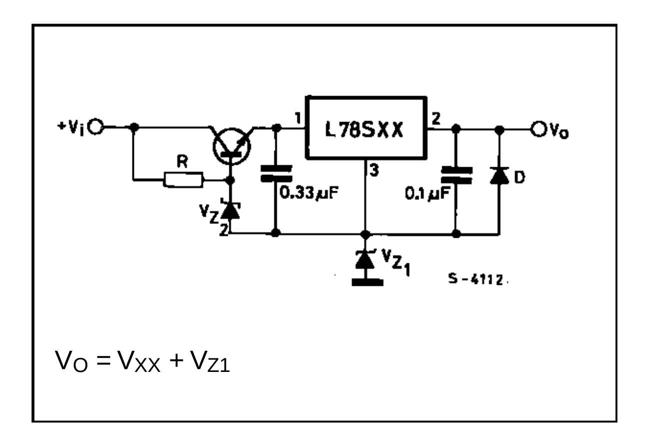
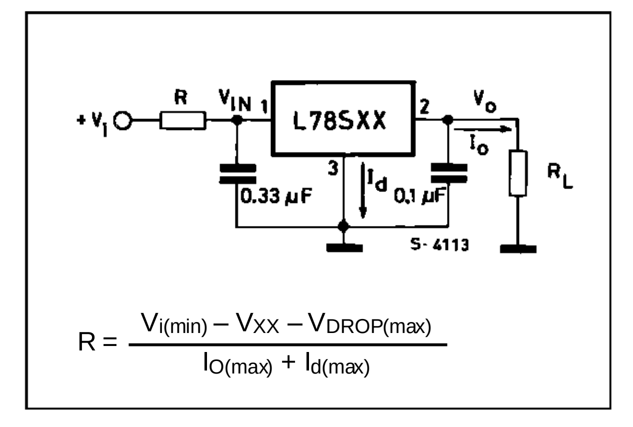


Figure 27 : High Input and Output Voltage.



$V_O = V_{XX} + V_{Z1}$

Figure 28 : Reducing Power Dissipation with Dropping Resistor.



$$R = \frac{V_{i(min)} - V_{XX} - V_{DROP(max)}}{I_{O(max)} + I_{d(max)}}$$

Figure 29 : Remote Shuntdown.

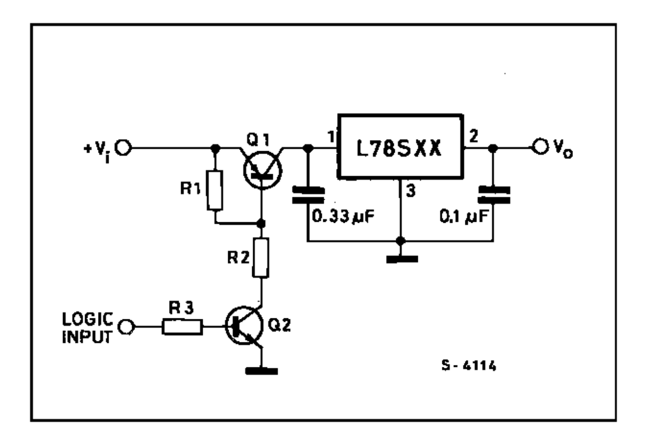
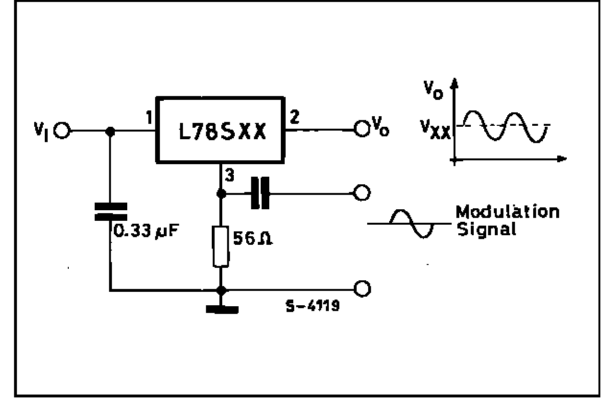
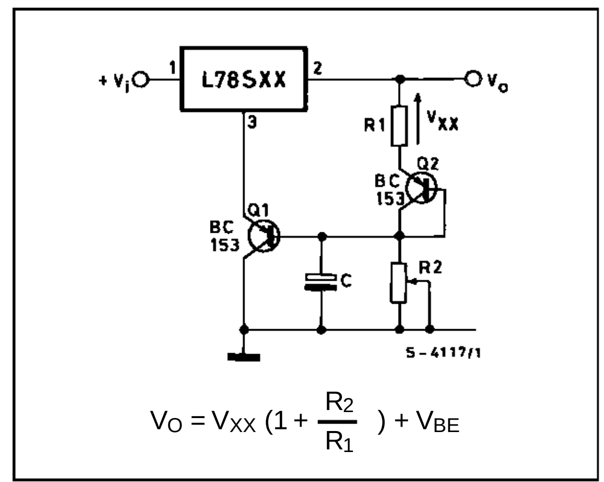


Figure 30 : Power AM Modulator (unity voltage gain, Io ≤ 1A).



Note : The circuit performs well up to 100KHz.

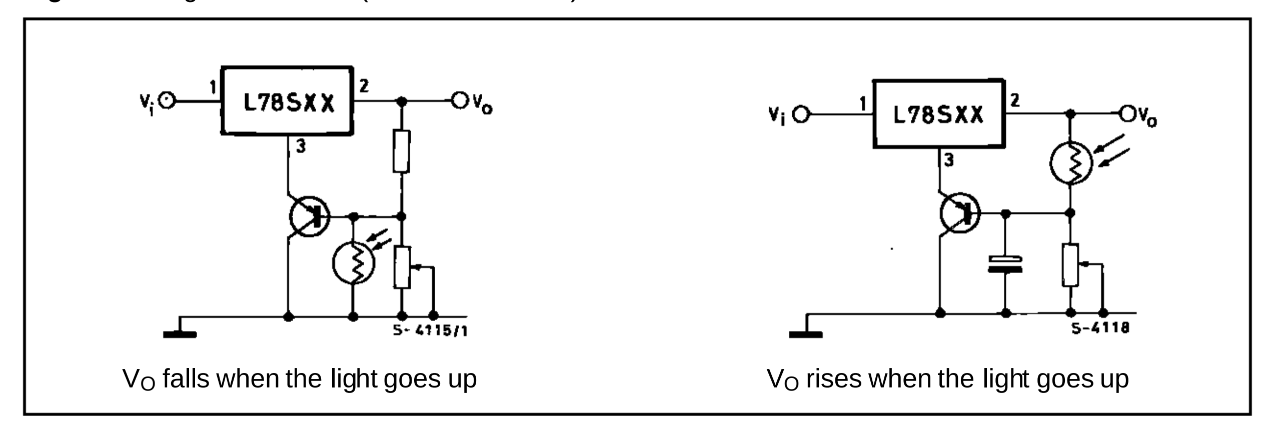
Figure 31 : Adjustable Output Voltage with Temperature Compensation.



$$V_O = V_{XX}\left(1 + \frac{R_2}{R_1}\right) + V_{BE}$$

Note : Q_2 is connected as a diode in order to compensate the variation of the Q_1 V_{BE} with the temperature. C allows a slow rise-time of the V_O

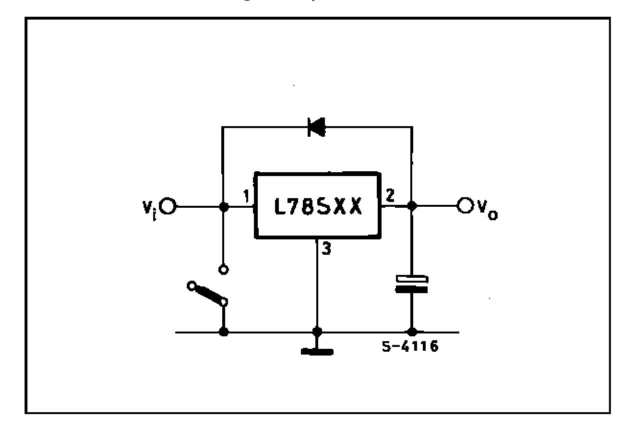
Figure 32 : Light Controllers ($V_{o\,min} = V_{XX} + V_{BE}$).



V_O falls when the light goes up

V_O rises when the light goes up

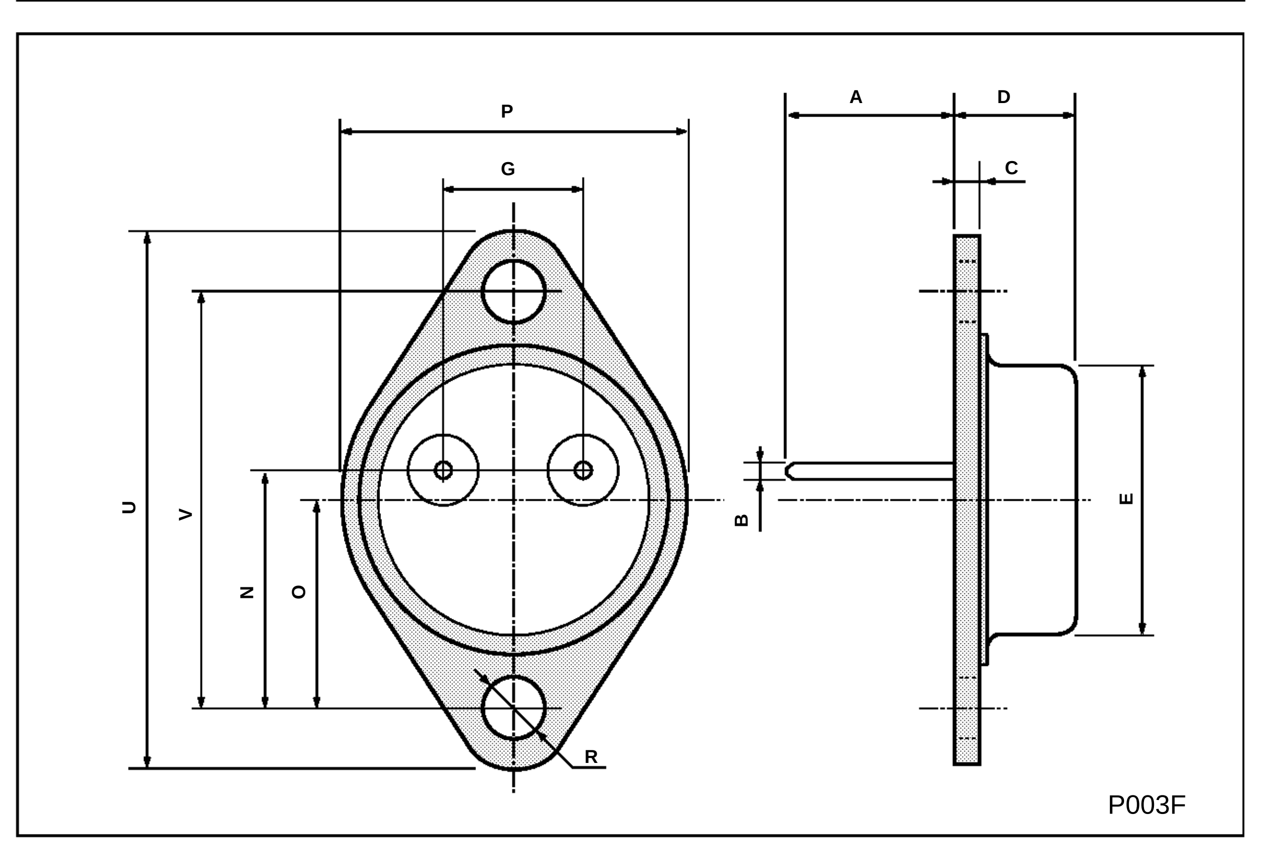
Figure 33 : Protection against Input Short-circuit with High Capacitance Loads.



Applications with high capacitance loads and an output voltage greater than 6 volts need an external diode (see fig. 33) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decreases showly. The capacitance discharges by means of the Base-Emitter junction of the series pass transistor in the regulator. If the energy is sufficiently high, the transistor may be destroyed. The external diode by-passes the current from the IC to ground.

TO-3 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.00		13.10	0.433		0.516
B	0.97		1.15	0.038		0.045
C	1.50		1.65	0.059		0.065
D	8.32		8.92	0.327		0.351
E	19.00		20.00	0.748		0.787
G	10.70		11.10	0.421		0.437
N	16.50		17.20	0.649		0.677
P	25.00		26.00	0.984		1.023
R	4.00		4.09	0.157		0.161
U	38.50		39.30	1.515		1.547
V	30.00		30.30	1.187		1.193



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.2		15.9	0.598		0.625
L7	6.2		6.6	0.244		0.260
L9	3.5		4.2	0.137		0.165
DIA.	3.75		3.85	0.147		0.151

